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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/683,781	02/13/2002	Jianying Li	GEMS8081.117	9495

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ZIOLKOWSKI PATENT SOLUTIONS GROUP, LLC (GEMS)
14135 NORTH CEDARBURG ROAD
MEQUON, WI 53097

EXAMINER	
SONG, HOON K	

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 03/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/683,781	LI ET AL.	
	Examiner	Art Unit	
	Hoon Song	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5-9,11-17 and 19-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-9,11-17 and 19-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 4-7, 9, 11-17 and 18-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Ozaki et al. (US 6275560B1).

Regarding claim 1, Ozaki teaches a method of voltage modulation for computed tomography (CT) imaging comprising the steps of (figure 11):

acquiring a set of cardiac signals (EKG) having a plurality triggering pulses (electro-cardiogram);

determining a period of delay (systole and diastole) after each triggering pulse (R);

after each period of delay, energizing a high frequency electromagnetic energy source to a first voltage (high);

acquiring a set of imaging data of a scan subject (27); and

after acquiring the set of imaging data, energizing the high frequency electromagnetic energy source to a second voltage (low) until the period of delay after a next triggering pulse (tube current).

Wherein the first voltage does not equal the second voltage (high and low).

Regarding claims 2 and 17, Ozaki teaches that the second voltage is less than the first voltage (high and low).

Regarding claim 4, Ozaki teaches that the step of (figure 3):

determining a primary (high) and a secondary (low) imaging stage from the set of cardiac signals;

energizing the high frequency electromagnetic energy projection source to the first voltage (high) during the primary imaging stage; and

energizing the high frequency electromagnetic energy projection source to the second voltage (low) during the secondary imaging stage (x-ray off).

Regarding claim 5, Ozaki teaches that the step of filtering low energy high frequency electromagnetic energy projected to the scan subject to reduce high frequency electromagnetic energy exposure to the scan subject (low and high)

Regarding claims 6 and 16, Ozaki teaches that the step of determining a radiation dosage profile from the set of cardiac signals (x-ray control signal).

Regarding claim 7, Ozaki teaches a radiation emitting imaging system comprising:

a high frequency electromagnetic energy projection source (x-ray source) configured to project high frequency energy toward a scan subject;

a detector assembly to receive high frequency electromagnetic energy attenuated by the scan subject and output a plurality of electrical signals indicative of the attenuation to a data acquisition system (27);

a control configured to:

determine a plurality of primary data acquisition stages and a plurality of secondary data acquisition stages (EKG, figure 11);

energize the high frequency electromagnetic energy projection source to a first voltage (high) during each data acquisition stage to acquire primary imaging data;

energize the high frequency electromagnetic energy projection source to a second voltage (low) different from the first voltage during each secondary data acquisition stage (low, non-data acquisition stage); and

reconstruct (35) an image of the scan subject from the imaging data acquired during each data acquisition stage.

Regarding claim 9, Ozaki teaches that each data acquisition stage is followed by a secondary data acquisition stage (figure 2).

Regarding claim 11, Ozaki teaches that the plurality of secondary data acquisition stages includes a plurality of non-data acquisition stages (figure 11)

Regarding claim 12, Ozaki teaches a plurality of EKG sensors (16) configured to acquire a set of EKG signals of a cardiac region of the scan subject (figure 11).

Regarding claim 13, Ozaki teaches that the control is further configured to determine a data acquisition stage (high) and a secondary acquisition (low) system from the set of EKG signals (figure 11).

Regarding claim 14, Ozaki teaches that the control is further comprised to determine a number of subsets from the set of EKG signals and determine a triggering

pulse within each subset and energize the high frequency electromagnetic energy projection source to the first voltage after a delay of the triggering pulse (figure 11).

Regarding claim 15, Ozaki teaches a computer readable storage medium having a computer program stored thereon and representing a set of instructions that when executed by a computer causes the computer (figure 11)to:

Analyze a set of cardiac motion signals acquired from a set of EKG sensors from a torso region of a scan subject (electro-cardiogram);

Determining from the set of cardiac motion signals a number of primary data acquisition stages and a number of secondary acquisition stages (x-ray control signal);

Transmit a first voltage modulation signal to a voltage source configured to energize an x-ray projection source used to project x-rays to the scan subject for data acquisition, the first voltage modulation signal configured to energize the voltage source to a first voltage (high) for each primary data acquisition stage;

Acquire a set of imaging data (27); and

Transmit a second voltage modulation signal to the voltage source, the second voltage modulation signal being configured to energize the voltage source to second voltage (low tube current) for each secondary acquisition stage, the second voltage (low) being different than the first voltage.

Regarding claim 19, Ozaki teaches that the set of instructions further causes the computer to reduce x-ray projections (low tube current) to the scan subject during the number of secondary acquisition stages.

Regarding claim 20, Ozaki teaches that the set of instructions further causes the computer to determine the first voltage from a set of imaging parameters on a per imaging session basis (figure 11).

Regarding claim 21, Ozaki teaches that the number of secondary acquisition states includes a number of non-data acquisition stages (figure 11).

Regarding claim 22, Ozaki teaches a method of cardiac CT imaging comprising the steps of:

Acquiring a series of cardiac signals defining a number of cardiac cycles (electro-cardiogram, figure 11);

Determining a primary acquisition period and a second acquisition period for each cardiac cycle (cardiac motion, figure 11);

Energizing an x-ray source to a default, non-zero voltage (tube current, figure 11);

Initiating CT data acquisition for the number of cardiac cycles (figure 11);

Energizing the x-ray source to a primary voltage during CT data acquisition for the primary acquisition period (high x-ray control signal, figure 11); and

Returning the x-ray source to the default, non-zero voltage during CT data acquisition for the secondary acquisition periods (figure 11, column 8 line 47+).

Regarding claim 23, Ozaki teaches the primary voltage includes a maximum voltage (figure 11).

Regarding claim 24, Ozaki teaches a radiation emitting imaging system comprising:

A high frequency electromagnetic energy projection source (x-ray source) configured to project high frequency energy toward a scan subject;

A detector assembly (23) to receive high frequency electromagnetic energy attenuated by the scan subject and output a plurality of electrical signal indicative of the attenuation to a data acquisition system (27);

A control configured to:

Model data acquisition for a heart of the scan subject based on a series of cardiac signals defining a number of cardiac cycles of the heart (figure 11);

Modulate voltage of the high frequency electromagnetic energy projection source between a first voltage (current tube, figure 11) and a second voltage (current tube, figure 11) during each cardiac cycle;

Acquire imaging data of the heat with the high frequency electromagnetic energy projection source at the first voltage (data acquisition) and the second voltage (non-data acquisition), the first voltages being different from the second voltage (since Ozaki's low voltage is not zero, the controller is acquiring any image data (noise, special frequency signal, detector noise etc.); and

Reconstruct an image of the scan subject for multiple phases of each cardiac cycle.

Regarding claim 25, Ozaki teaches that the first voltage includes a default voltage and the second voltage includes a maximum voltage (tube current, figure 11).

Regarding claim 26, Ozaki teaches the default voltage includes a minimum voltage required to acquire data (column 8 line 47+).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ozaki in view of Hampel et al. (US 6298117B1).

Regarding claim 8, Ozaki fails to teach a bowtie filter configured to filter a portion of the high frequency electromagnetic energy projected by the high frequency electromagnetic energy projection source to the scan subject.

Hampel teaches a CT scanner having a bowtie filter.

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the CT system of Ozaki with the bowtie filter as taught by Hampel, since the device of Hampel would reduce an x-ray dosage for the patient.

Response to Arguments

Applicant's arguments filed February 26, 2004 have been fully considered but they are not persuasive.

Applicant's arguments with respect to claims 1-2, 4-9, 11-17 and 18-21 have been considered but are moot in view of the new ground(s) of rejection.

In response to applicant's argument that Ozaki et al. fails to teach CT data is acquired during each of the primary and secondary acquisition period, the examiner respectfully disagrees with that because in light of the specification, the controller is

acquiring imaging data during the primary image data acquisition period but not during the second voltage. Instead, the controller is controlling the x-ray tube at second voltage period and by using bowtie filter, the x-rays during second voltage period are filtered out and non image data is acquired by the CT imaging system during that period (page 7, 4th paragraph). Furthermore, since Ozaki's second voltage is not completely turned off during the second voltage period, system is acquiring any data (imaging data), such as system noise, spatial noise etc.). Thus, the applicant's argument is not persuasive.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoon Song whose telephone number is (571) 272-2494. The examiner can normally be reached on 8:30 AM - 5 PM, Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Glick can be reached on (571) 272 - 2490. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HKS

3/17/04
HKS

EDWARD J. GLICK
SUPERVISORY PATENT EXAMINER